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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/616,251	07/08/2003	Peter Martin	484	9476

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EXAMINER	
YANG, NELSON C	

ART UNIT	PAPER NUMBER
1641	

MAIL DATE	DELIVERY MODE
10/02/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of Allowability	Application No.	Applicant(s)	
	10/616,251	MARTIN ET AL.	
	Examiner	Art Unit	
	Nelson Yang	1641	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the response filed April 21, 2008*.

2. ☒ The allowed claim(s) is/are *1-27,29-34, 36-47, renumbered 1-45*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

/Nelson Yang/
Patent Examiner, Art Unit 1641

DETAILED ACTION

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with John Ross on August 11 and September 15, 2008. This examiner's amendment includes amendments to the claims made in the Examiner's amendment mailed August 26, 2008.

Please amend the Brief Description of the Drawings in the specification as follows:

On p. 4, line 21, please change FIGS. 6A&B to FIGS. 6A-C.

On p. 4, line 24, please change FIG. 9 to FIG. 9A-F.

On p. 5, line 6, please change FIG. 15 to FIGS. 15A and 15B

In claims 32, 36, 37 please change "The method as in claim 27" to "The method as in claim 31".

In claims 33 and 34, please change "The method as in claim 28" to "The method as in claim 32".

Please cancel claim 35.

In claims 39 and 40, please change "The sensor as in claim 34" to "The sensor as in claim 38".

In claims 45-47, please change "Claim" to "claim".

Please amend claims 1, 31, 38, 41, 42, and 45 as follows:

1. An optical sensor for monitoring molecular binding interactions, said sensor comprising:

A) at least one porous silicon region comprising more than 1000 pores, each pore having a nominal width and a nominal depth at least 10 times larger than said nominal width, with the

depth of each pore being approximately equal to the depth of at least most other pores in said porous silicon region, said porous silicon region defining a top surface and a bottom surface, and said bottom surface being parallel or approximately parallel to said top surface;

B) at least one buffer-sample fluid flow channel located above said at least one porous silicon region providing a fluid flow passage across said porous silicon region;

C) at least one light source for illuminating said at least one porous silicon region;

D) at least one interference monitor adapted to monitor interference patterns caused by interference of light reflected from said top surface with light reflected from said bottom surface of said at least one porous silicon region, said interference monitor comprising a deep well linear photodiode array of pixels, each pixel having a photoelectron full well capacity of about 156 million photoelectrons or more, and having a frame rate of about one hundred or more frames of interference fringe data per second;

E) a fluid flow control system for producing controlled flow of buffer solutions, ligand containing solutions, and analyte containing solutions through said at least one fluid flow channel; and

F) a computer processor programmed with a computer program ~~for making~~ causing said processor to execute molecular binding measurements based on changes in the interference patterns monitored by the at least one interference monitor while analytes bind with and disassociate from ligands attached to surfaces of said pores, said computer program comprising ~~:a special correlation method~~ executable instructions for calculating optical path differences in measured interference fringe patterns ~~wherein the measured fringe patterns is~~ that are correlated

to a test fringe pattern, wherein the test fringe pattern varies sinusoidally as a function of optical path differences divided by the wavelength of said light.

31. A method for measuring molecular binding interactions, utilizing an optical sensor comprising ~~having~~:

a) at least one porous silicon region comprising more than 1000 pores, each pore having a nominal width and a nominal depth at least 10 times larger than said nominal width, with the depth of each pore being approximately equal to the depth of at least most other pores in said porous silicon region, said porous silicon region defining a top surface and a bottom surface, and said bottom surface being parallel or approximately parallel to said top surface;

b) at least one buffer-sample fluid flow channel located above said at least one porous silicon region providing a fluid flow passage across said porous silicon region;

c) at least one light source for illuminating said at least one porous silicon region;

d) at least one ~~spectral~~ interference monitor ~~for~~ adapted to monitor~~ing~~ interference fringe patterns caused by interference of light reflected from said top surface with light reflected from ~~and~~ said bottom surface of said at least one porous silicon region, said interference monitor comprising a deep well linear photodiode array of pixels, each pixel having a photoelectron full well capacity of about 156 million photoelectrons or more, and having a frame rate of about one hundred or more frames of interference fringe data per second;

e) a fluid flow control system for producing controlled flow of buffer solutions, ligand containing solutions, and analyte containing solutions through said at least one fluid flow channel; and

f) a computer processor programmed with a computer program ~~for making~~ causing said processor to execute kinetic binding measurements based on changes in the spectral interference patterns monitored by the at least one interference monitor while analytes bind with and disassociate from ligands attached to surfaces of said pores, said computer program comprising ~~:a special correlation method~~ executable instructions for calculating optical path differences in measured interference fringe patterns ~~monitored by said at least one spectral monitor while analytes bind with and disassociate from ligands attached to surfaces of said pores~~ that are correlated the measured interference fringe patterns to a test fringe pattern, wherein the test fringe pattern varies sinusoidally as a function of optical path differences divided by the wavelength of said light;

wherein said method comprises:

A) immobilizing ligand molecules within said pores;

B) causing a solution containing analyte molecules to flow across said porous silicon region to permit analyte molecules to diffuse close to and become bound at least temporarily ~~by~~ to said ligand molecules to form interference fringe patterns;

C) illuminating at least a portion of said porous silicon region so as to produce reflections from said bottom surface and said top surface; and

D) monitoring changes in ~~spectral~~ interference fringe patterns produced by light reflected from said top and bottom surfaces in order to obtain information concerning binding reactions between said ligand and said analyte.

38. An optical sensor for monitoring molecular binding interactions, said sensor comprising:

A) at least one porous silicon region comprising more than 1000 pores, each pore having a nominal width and a nominal depth at least 10 times larger than said nominal width, with the depth of each pore being approximately equal to the depth of at least most other pores in said porous silicon region, said porous silicon region defining a top surface and a bottom surface, and said bottom surface being parallel or approximately parallel to said top surface;

B) at least one buffer-sample fluid flow channel located above said at least one porous silicon region providing a fluid flow passage across said porous silicon region;

C) at least one light source for illuminating said at least one porous silicon region;

D) at least one interference monitor adapted to monitor interference patterns caused by interference of light reflected from said top surface with light reflected from said bottom surface of said at least one porous silicon region, said interference monitor comprising a deep well linear photodiode array of pixels, each pixel having a photoelectron full well capacity of about 156 million photoelectrons or more, and having a frame rate of about one hundred or more frames of interference fringe data per second;

E) a fluid flow control system for producing controlled flow of buffer solutions, ligand containing solutions, and analyte containing solutions through said at least one fluid flow channel; and

F) a processor means programmed with a computer program ~~for making~~ causing said processor means to execute kinetic molecular binding measurements based on changes in the interference patterns monitored by the at least one interference monitor while analytes bind with and disassociate from ligands attached to surfaces of said pores, said computer program comprising ~~:a special correlation method~~ executable instructions for calculating optical path differences in

measured interference fringe patterns ~~calculation of optical path differences from measured interference fringe patterns wherein each measured fringe pattern is~~ that are correlated to a test fringe pattern, wherein the test fringe pattern varies sinusoidally as a function of optical path differences divided by the wavelength of said light.

41. An optical sensor for monitoring molecular binding interactions, said sensor comprising:

A) at least one porous silicon region, said porous silicon region defining a top surface and a bottom surface, and said bottom surface being parallel or approximately parallel to said top surface;

B) at least one buffer-sample fluid flow channel located above said at least one porous silicon region providing a fluid flow passage across said porous silicon region;

C) at least one light source for illuminating said at least one porous silicon region;

D) at least one interference monitor adapted to monitor interference patterns caused by interference of light reflected from said top surface with light reflected from said bottom surface of said at least one porous silicon region, said interference monitor comprising a deep well linear photodiode array of pixels, each pixel having a photoelectron full well capacity of about 156 million photoelectrons or more, and having a frame rate of about one hundred or more frames of interference fringe data per second;

E) a fluid flow control system for producing controlled flow of buffer solutions, ligand containing solutions, and analyte containing solutions through said at least one fluid flow channel; and

F) a computer processor programmed with a computer program ~~for making~~ causing said processor to execute molecular binding measurements based on changes in the interference patterns monitored by the at least one interference monitor while analytes bind with and disassociate from ligands attached to surfaces of said pores, said computer program comprising ~~:a special correlation method~~ executable instructions for calculating optical path differences in measured interference fringe patterns ~~calculation of optical path differences from measured interference fringe patterns wherein each measured fringe pattern is~~ that are correlated to a test fringe pattern, wherein the test fringe pattern varies sinusoidally as a function of optical path differences divided by the wavelength of said light.

42. An optical sensor for monitoring molecular binding interactions, said sensor comprising:
A) at least one porous silicon region comprising more than 1,000 pores, each pore having a nominal width and a nominal depth at least 10 times larger than said nominal width, with the depth of each pore being approximately equal to the depth of at least most other pores in said porous silicon region, said porous silicon region defining a top surface and a bottom surface, and said bottom surface being parallel or approximately parallel to said top surface;
B) at least one buffer-sample fluid flow channel located above said at least one porous silicon region providing a fluid flow passage across said porous silicon region;
C) at least one light source for illuminating said at least one porous silicon region;
D) at least one interference monitor adapted to monitor interference patterns caused by interference of light reflected from said top surface with light reflected from said bottom surface of said at least one porous silicon region, said interference monitor comprising a deep well linear

photodiode array of pixels, each pixel having a photoelectron full well capacity of about 156 million photoelectrons or more, and having a frame rate of about one hundred or more frames of interference fringe data per second;

E) a fluid flow control system for producing controlled flow of buffer solutions, ligand containing solutions, and analyte containing solutions through said at least one fluid flow channel; and

F) a computer processor programmed with a computer program ~~for making~~ causing said processor to execute molecular concentration measurements based on changes in the interference patterns monitored by the at least one interference monitor while analytes bind with and disassociate from ligands attached to surfaces of said pores, said computer program comprising ~~:a special correlation method~~ executable instructions for calculating optical path differences in measured interference fringe patterns ~~calculation of optical path differences from measured interference fringe patterns wherein each measured fringe pattern is~~ that are correlated to a test fringe pattern, wherein the test fringe pattern varies sinusoidally as a function of optical path differences divided by the wavelength of said light.

45. The optical sensor as in claim 1, wherein said sensor is adapted to produce fringe patterns with signal to noise ratios of about 90,000.

The following is an examiner's statement of reasons for allowance: the prior art fails to teach a test fringe pattern that varies sinusoidally as a function of optical path differences divided by the wavelength of the light.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nelson Yang whose telephone number is (571)272-0826. The examiner can normally be reached on 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long V. Le can be reached on (571)272-0823. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nelson Yang/
Patent Examiner, Art Unit 1641

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	10/616,251	MARTIN ET AL.	
	Examiner	Art Unit	
	Nelson Yang	1641	